

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re application of	)	
	)	
DAVID M. SINGLETON, LOUIS KRAVETZ,	)	
BRENDAN D. MURRAY	)	Confirmation No.: 9045
	)	
Serial No. 09/655,964	)	Group Art Unit: 1796
	)	
Filed September 6, 2000	)	Examiner: Necholus Ogden Jr.
	)	
HIGHLY BRANCHED PRIMARY ALCOHOL	)	March 29, 2010
COMPOSITIONS, AND BIODEGRADABLE	)	
<u>DETERGENTS MADE THEREFROM</u>	)	

COMMISSIONER FOR PATENTS  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

APPEAL BRIEF

The Appellants hereby file this appeal brief in response to the rejection of January 7, 2010 of claims 1-4, 6-8, 12, 70, 72, 73, 75-77, 79, 81-89, 92-98, 101-109 is being appealed herein. The last office action referred to the rejection of claims 4,6-8, 11, 12, 70, 72, 73, 75-77 and 79-109; but applicants have no record of the disposal of claims 1-3 and claims 80, 90-91 and 99-100 were canceled, so it is assumed that the listing of claims by the Examiner contains a typographical error in the Office Action. The claims under appeal are the same claims that were the subject of a Notice of Allowance issued by this Examiner on October 19, 2009.

### Real Party in Interest

The real party in interest is Shell Oil Company.

### Related Proceedings

Copending related application Serial No. 11/748,976 has been found to have allowable claims and is the subject of an Ex parte Quayle action. Copending related application Serial No. 12/119,422, filed May 12, 2008, has been rejected.

### Status of the Claims

Claims 1-12 were originally filed in this continuation application and claims 13-69 of the parent application were canceled. Claims 70-83 were added in the Preliminary Amendment of September 6, 2000. Claims 1 and 4 were amended and claim 84 was added in the response of June 11, 2002. In the response of March 7, 2003, claims 1, 12, 70 and 75 were amended, claims 11 and 74 were canceled and new claims 85-102 were added. Claim 71 was canceled in the response of November 1, 2006. The final form of the claims is as presented in the response of July 16, 2007 in which claims 1, 6, 70, 77, 85 and 94 were amended, claims 5, 9-10, 76, 78, 80, 90-91 and 99-100 were canceled, and claims 103-109 were added. The rejection of claims 1-4, 6-8, 12, 70, 72, 73, 75-77, 79, 81-89, 92-98, 101-109 is being appealed herein.

### Status of Amendments

No amendments have been filed subsequent to the rejection.

### Summary of Claimed Subject Matter

Claim 1 describes a biodegradable sulfate composition comprising sulfates of an alkyl branched primary alcohol composition having an average chain length per molecule of 14 to 19 carbon atoms, an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, at least 40 percent methyl branches, 5 to 30 percent ethyl branches and 5 to 25 percent of the number of branches are on the C<sub>2</sub> atoms of the composition. The sulfate composition is described at page 4, lines 14-20, of the specification. The average chain length per molecule of 14 to 19 carbon atoms is described at page 8, lines 19 and 20 of the specification and in Table III on page 34. The average number of branches per molecule of 0.7 to 2.3 is described at page 4, line 19 and page 5, line 7 of the specification. The less than 0.5 atom % of quaternary carbon atoms is described at page 9, lines 8-16, of the specification. The at least 40 percent of the branches being methyl branches is described at page 10, lines 25-27, of the specification. The range of 5 to 30 percent ethyl branches is described at page 10, lines 3-5, of

the specification and page 11, lines 2-4. The range of 5 to 25 percent of branching on the C<sub>2</sub> atom is described at page 9, lines 28-30, through page 10, lines 1-2, of the specification.

Claim 70 focuses on a primary branched alcohol composition which is as described in claim 1 except that the average number of branches per molecule is 0.7 to 2.1. The 0.7 to 2.1 range is described at page 8, lines 25-28, of the specification.

Claim 77 focuses on a branched primary alcohol composition as described in claim 1 except that from 10 to 50 percent of the branches are located at the C<sub>3</sub> position relative to the hydroxyl carbon atom. The 10 to 50 percent range is described at page 10, lines 3-7, of the specification.

Claim 85 describes a sulfate composition of an alkyl branched primary alcohol having an average chain length per molecule of 14 to 17 carbon atoms. The 14 to 17 carbon atom range is described in Table III on page 34 of the specification. The average number of branches per molecule of 0.7 to 2.3 is described at page 4, line 19 and page 5, line 7 of the specification. The less than 0.5 atom % of quaternary carbon atoms is described at page 9, lines 8-16, of the specification. The at least 40 percent of the branches being methyl branches is described at page 10, lines 25-27, of the specification. The range of 5 to 30 percent ethyl branches is described at page 10, lines 3-5, of the specification and page 11, lines 2-4. The range of 5 to 25 percent of branching on the C<sub>2</sub> atom is described at page 9, lines 28-30, through page 10, lines 1-2, of the specification.

Claim 94 describes a branched primary alcohol composition as described above with respect to claim 85. The 14 to 17 carbon atom range is described in Table III on page 34 of the specification. The average number of branches per molecule of 0.7 to 2.3 is described at page 4, line 19 and page 5, line 7 of the specification. The less than 0.5 atom % of quaternary carbon atoms is described at page 9, lines 8-16, of the specification. The at least 40 percent of the branches being methyl branches is described at page 10, lines 25-27, of the specification. The range of 5 to 30 percent ethyl branches is described at page 10, lines 3-5, of the specification and page 11, lines 2-4. The range of 5 to 25 percent of branching on the C<sub>2</sub> atom is described at page 9, lines 28-30, through page 10, lines 1-2, of the specification.

### Grounds of Rejection to be Reviewed on Appeal

The first ground of rejection to be reviewed upon this appeal is whether or not claims 1-4, 6-8, 12, 70, 72, 73, 75-77, 79, 81-89, 92-98, 101-109 presented upon appeal are obvious under Section 103(a) as being unpatentable over Hunter (US 3,786,003).

The second ground of rejection to be reviewed upon this appeal is whether or not claims 1-4, 6-8, 12, 70, 72, 73, 75-77, 79, 81-89, 92-98, 101-109 presented herein are obvious under Section 103(a) in view of Grifo (US 2,766,212).

The third ground of rejection to be reviewed upon this appeal is whether or not claims 1-4, 6-8, 12, 70, 72, 73, 75-77, 79, 81-89, 92-98, 101-109 presented herein are obvious under Section 103(a) in view of Oswald et al. (US 5,072,057).

### Argument

To further frame these arguments, the same Examiner named herein who has rejected these claims has allowed claims in copending application Serial No. 11/748,976 which is a divisional of this application. The Examiner had made similar rejections in the copending application based on the Hunter and Grifo references, but later found the claims allowable in light of an appeal brief with similar arguments to what is presented below. Further the same Examiner earlier found the claims under appeal allowable in light of the Oswald et al reference which is the subject of the third ground of rejection discussed herein.

#### *Section 103(a) Rejection Based on Hunter*

##### A. No Prima Facie Case for Obviousness has Been Established

The Examiner admits that Hunter “lacks a specific teaching with sufficient specificity with respect to the branching proportions” but concludes that it would have been obvious to one of ordinary skill in the art to expect similar characteristics and properties from the sulfated alcohols of Hunter “because they are the same compounds but different isomers.” Similarly, the Examiner states that “Grifo lacks a specific teaching with sufficient specificity with respect to the branching proportions and the position of said branching” but concludes that it also would have been obvious to expect similar characteristics and properties from the sulfated alcohols of Grifo “because they are the same compounds but different isomers.” In re Payne, 606 F.2d 303, 203 USPQ 245, is

quoted: “An obviousness rejection based on similarity in chemical structure and function entails the motivation of one skilled in the art to make a chemical compound, in the expectation that compounds similar in structure will have similar properties.”

The Applicants dispute the conclusion that a *prima facie* case of obviousness was made with respect to either reference.

However, before discussing the inapplicability of the “structural similarity” obviousness rationale in the present application, Applicants note that even assuming *arguendo* that this “structural similarity” obviousness analysis is appropriate and further assuming *arguendo* that the references disclose, as asserted by the Examiner, an isomer of the presently claimed compositions, these assumed facts would not automatically be conclusive proof of *prima facie* obviousness. MPEP 2144.09 states:

**HOMOLOGY AND ISOMERISM ARE FACTS WHICH  
MUST BE CONSIDERED WITH ALL OTHER RELEVANT  
FACTS IN DETERMINING OBVIOUSNESS**

Compounds which are position isomers (compounds having the same radicals in physically different positions on the same nucleus) or homologs (compounds differing regularly by the successive addition of the same chemical group, e.g., by -CH<sub>2</sub>- groups) are generally of sufficiently close structural similarity that there is a presumed expectation that such compounds possess similar properties. . . .

Isomers having the same empirical formula but different structures are not necessarily considered equivalent by chemists skilled in the art and therefore are not necessarily suggestive of each other. *Ex parte Mowry*, 91 USPQ 219 (Bd. App. 1950) (claimed cyclohexylstyrene not *prima facie* obvious over prior art isohexylstyrene). Similarly, homologs which are far removed from adjacent homologs may not be expected to have similar properties. *In re Mills*, 281 F.2d 218, 126 USPQ 513 (CCPA 1960) (prior art disclosure of C<sub>8</sub> to C<sub>12</sub> alkyl sulfates was not sufficient to render *prima facie* obvious claimed C<sub>1</sub> alkyl sulfate).

Homology and isomerism involve close structural similarity which must be considered with all other relevant facts in determining the issue of obviousness. . . . Homology should not be automatically equated with *prima facie* obviousness because the claimed invention and the prior art must each be viewed “as a whole.” . . . (emphasis added).

Applicants first note that the compound of Hunter and the claimed compositions are not, as the Examiner seems to suggest, position isomers as defined above in the quote from MPEP 2144.09 because position isomers according to MPEP 2144.09 are “compounds having the same radicals in physically different positions on the same nucleus.” As discussed in detail below, such similarities do not exist in the present case. More importantly, based on MPEP 2144.09, if it is assumed *arguendo* that a “structural similarity” obviousness analysis is appropriate in the present case and if it is further assumed *arguendo* that Hunter discloses, as asserted by the Examiner, an isomer of the presently claimed compounds, the assumed isomerism would be only one factor out of many factors to be considered in the determination of obviousness. The Examiner still must consider an invention as a whole. Therefore, the Examiner must consider all of the limitations of the present claims (for example, limitations relating to branching) and must not simply ignore all of the limitations not disclosed by Hunter. Applicants respectfully submit that a bare assertion that one isomer renders all other isomers obvious is inappropriate.

As previously mentioned, Applicants respectfully assert that the Examiner’s “structural similarity” arguments cannot support *prima facie* obviousness rejections of the present claims over Hunter. Applicants submit that the “structural similarity” obviousness analysis is applicable only in situations wherein prior art discloses structures that are very close to claimed structures. Applicants point out that the title of MPEP 2144.09 is “Close Structural Similarity Between Chemical Compounds (Homologs, Analogues, Isomers)” (emphasis added) and that the first statements within that section are as follows:

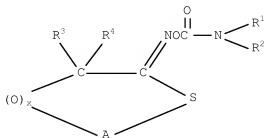
**REJECTION BASED ON CLOSE STRUCTURAL  
SIMILARITY IS FOUNDED ON THE EXPECTATION  
THAT COMPOUNDS SIMILAR IN STRUCTURE WILL  
HAVE SIMILAR PROPERTIES**

*A prima facie* case of obviousness may be made when chemical compounds have very close structural similarities and similar utilities (emphasis added).

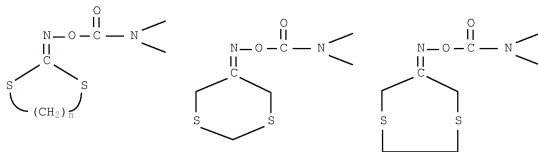
To illustrate the Applicants’ position on the meaning of “very close structural similarity,” without commenting on the correctness or currency of other holdings or discussions therein, Applicants refer to the cases cited by the Examiner in rejecting the present claims based on structural similarity: *In re Payne*, 606 F.2d 303, 203 USPQ 245 (CCPA 1979); *In re Papesch*, 315 F.2d 381, 137 USPQ 43 (CCPA 1963); *In re Dillon*, 919 F.2d 688, 16 USPQ2d 1897 (Fed.

Cir. 1991). In each of these cases, specific molecular structures (individual molecule graphically illustrated, specifically named, or represented by formula, etc.) capable of bond-by-bond and atom-by-atom comparison were present both in the claims and in the prior art upon which “close structural similarity” obviousness rejections were based.

For example, in *In re Payne*, 606 F.2d 303, 203 USPQ 245 (CCPA 1979), claim 1 recited the structural formula:



“Structural similarity” obviousness rejections under appeal had been based upon prior art disclosing the following structures:



In all of the cases cited by the Examiner in support of the Examiner’s structural obviousness rejections, the distinct structural similarities and differences between the prior art in those cases and the claims of those cases were clearly and readily capable of visualization, characterization, and enumeration. Applicants assert that the “structural similarity” obviousness analysis is most readily applicable in these types of situations where both prior art and claims show specific molecular structures (individual molecule graphically illustrated, specifically named, or represented by formula, etc.). Bond-by-bond and atom-by-atom comparisons inherently conducted in such situations make it possible to determine whether molecular structural similarities are extremely numerous and molecular structural differences are very insignificant, such as where the types of molecular structural differences present are well-known to tend to have no significant effect upon molecular properties. In instances of extremely

numerous structural similarities coupled with very insignificant differences, it might be said that one of ordinary skill in the art would be motivated to arrive at claimed compounds by making insignificant modifications to known prior art compounds, retaining in the modified compounds most of the structural features of the original known compounds. The motivation to make the insignificant modifications while retaining most other structural features is based upon the desire to create modified compounds having the same properties as the original known prior art compounds. One of ordinary skill in the art would expect the properties of insignificantly modified compounds to be the same as properties of the known prior art compounds if the structural similarities between the modified and known compounds are numerous enough.

This reasoning is based on numerous molecular structural similarities coupled with very insignificant molecular structural differences. If these factors are present, very insignificant differences can be ignored, under appropriate circumstances, as obvious modifications. Absent sufficiently numerous specifically identifiable similarities or in the presence of differences that are not insignificant, Applicants contend that the differences should not be ignored. The “structural similarity” obviousness analysis should be reserved for situations involving very close structural similarities (MPEP 2144.09), and in all other instances the Examiner must point to teachings or suggestions of each and every limitation of the claims.

#### 1. The Structural Dissimilarities make the Properties Different

In asserting obviousness in the present application, the Examiner has made and relied upon general assertions of “structural similarity,” but the Examiner has not pointed to very close and numerous structural similarities between the presently claimed compositions and compositions of Hunter. The general assertion of structural similarity made by the Examiner is limited to “because they are the same compounds but different isomers” (no showing of why this is so) certainly cannot be said to rise to the level of numerous structural similarities typically observed when known and claimed specific molecular structures (individual molecule graphically illustrated, specifically named, or represented by formula, etc.) have been compared in a bond-by-bond and atom-by-atom fashion and found to be obvious variants of each other. Furthermore, the differences between compositions of Hunter and the present claims, which differences have been ignored by the Examiner, are not insignificant. The Examiner has ignored



limitations of the present claims which are not well-known in the art to have little effect on properties.

The branched alcohols described in Hunter are all 2-alkyl branched compounds. They have to be by virtue of the description at column 2, lines 2-69, Formulas II and III. "Very close structural similarity" does not exist in this case since the reference describes 100 percent 2-alkyl branching and the present invention describes a composition wherein only 5 to 25% of the branches are at the 2 position. This means that compositions of the present invention cannot have 100 percent branching at the C<sub>2</sub> position. The reference does not describe materials such as those that are claimed in the present application and thus it cannot suggest that improved soil removal and cold water detergency could be achieved by modifying the 100 percent C<sub>2</sub> position branched alcohols described therein by reducing the C<sub>2</sub> branching to as little as 5 percent.

The inventors herein were honored for this invention at the Southwest Regional Industrial Innovation Awards Program Symposium of the American Chemical Society. The Applicants submit this as evidence of commercial success which rebuts a case of prima facie obviousness. A copy of the announcement is attached hereto as Evidence Appendix D. A copy of the presentation which was given at the Awards Ceremony is also enclosed herewith as Evidence Appendix E. The presentation contains several slides which are relevant to the question of whether or not the differences between the alcohols of the reference and the presently claimed alcohols are "significant" in that whatever structural similarity exists between the two sets of alcohols is not sufficient to predict the properties of the presently claimed alcohols from what is known about the alcohols of the reference.

Slide 16 relates to the Krafft temperature of selectively branched alcohol sulfates within the scope of the present claims (the top 3 alcohols in the slide), sulfates of alcohols which have almost all ethyl or methyl branching at the C<sub>2</sub> position (the fifth and sixth alcohols in the slide), and the sulfate of one linear C<sub>16</sub> alcohol (the last alcohol in the slide). The Krafft temperature is the temperature at which the mixture containing the alcohol sulfates becomes clear and is an indication of solubility. Since cold water detergency is one of the goals of the present invention, it is better when the Krafft temperature is lower. As can be seen, all three of the selectively branched alcohol sulfates of the present invention have considerably lower Krafft temperature than the sulfates where almost all of the branching is 2-ethyl or 2-methyl (which are most akin to the alcohol sulfates described in the reference). This is another indication that the previously

discussed differences in structure between the alcohol of the reference and the presently claimed alcohol do make a significant difference and that the properties of sulfates of the present invention cannot be predicted from the disclosure of the reference.

Slide 17 shows another physical property difference between the branched alcohol sulfates. The calcium tolerance of the branched alcohol sulfates of the present invention is much higher than the calcium tolerance of the 2-ethyl and 2-methyl branched alcohol sulfates. Slide 19 clearly shows that the detergency performance (at 10°C and 150 ppm water hardness) of the branched alcohol sulfates of the present invention is much better than the detergency performance of the 2-ethyl branched alcohol sulfate and the linear alcohol sulfate (more data that supports the nonobviousness of this invention). This data also shows that the structural differences between the two sets of alcohols give different physical properties and that the properties of the sulfates of the present invention cannot be predicted from the disclosure of the reference.

A portion of this data appears in the article "Solution and Performance Properties of New Biodegradable High-Solubility Surfactants" in Tables 8, 9 and 11 wherein branched alcohol sulfates of this invention are referred to as random methyl alcohol sulfates (RMC15, RMC1617, RMC18). This article, which is enclosed herewith as Evidence Appendix F, was published as part of the proceedings of the 5th World Surfactants Congress in 2000.

Another slide on detergency performance of these alcohol sulfates which was not part of the presentation (which is also enclosed herewith as Evidence Appendix G) includes detergency performance data for alcohol sulfates which contain almost 100 percent either 2-hexyl, 2-butyl, 2-ethyl, or 2-methyl branching. Looking at this slide, it can be seen that the C<sub>15</sub> and C<sub>16, 17</sub> alcohol sulfates have greatly enhanced detergency performance as compared to the branched alcohol sulfates which have almost 100 percent branching at the C<sub>2</sub> position and particularly much better detergency performance than the 2-hexyl and 2-butyl branched alcohol sulfates. The C<sub>18</sub> selectively branched alcohol sulfate also had better detergency performance than all of the others but the difference is not quite as dramatic. Again, this data shows that the structural differences between the branched alcohol sulfates result in different physical properties which cannot be predicted.

The chain length of Hunter's branched alcohols is described in Formula II in column 2 – the chain described there includes the primary alcohol carbon (1), the secondary carbon where

the branch is located (2), the terminal carbon (3), and the mid-chain carbons (n). In the Applicants structure, there must be from 5 to 30% ethyl branches. Thus, m in Formula II would have to be 2. Since  $m + n$  can be no more than 12, n can be no more than 10. Thus, the maximum chain length for Hunter's branched alcohols is 13, less than the minimum chain length of the compositions of the present invention.

Very close structural similarity does not exist in this case and very close structural similarity is required for the analysis applied by the Examiner in the present rejections. It is insufficient for the Examiner to rely on broad assertions that the claimed compositions and the compositions of Hunter generally fall within the same class or are generally related. Therefore, the guidelines associated with very close structural similarity should not be applied to the present claims and there is no justification for ignoring differences between the present claims and compositions of Hunter. No prima facie case for obviousness has been established.

## 2. There is no Structural Similarity

The Applicants disagree with the Examiner that Hunter lacks a specific teaching with sufficient specificity with respect to the branching proportions. First, at column 2, lines 25-28, Hunter states that it is preferred that the structure be at least 70% straight chain. This would be 0.3 branches per molecule. At column 2, lines 40-46, Hunter states that the branched alcohols of his invention are produced by the hydroformylation of straight chain olefins of 10 to 14 carbon atoms as described in U.S. Patents 3,420,898 and 3,440,291. These two patents, Van Winkel et al., describe a basic hydroformylation process which is still used today.

One of the goals and advantages of the process described in the '898 patent was "... to obtain a predominant portion of the product in the form of the normal or straight chain compound rather than as its various branched-chain isomers (Column 7, lines 51-53)." Examples 3, 5 and 7 are the only examples which describe the linearity of the products of the reaction of the invention. In Example 3, 1-dodecene was hydroformylated and in the first paragraph 52 percent of the alcohols obtained were linear. In the second paragraph of Example 3, 89 percent of the alcohols obtained were linear straight chain. In Example 5, the alcohols obtained were 87.6 percent linear. In Example 7, the linearities of the alcohols were 84.0, 86.6, 87.5 and 89.7 percent.

In the '291 patent, at column 4, lines 55-57, it is stated "The alcohols obtained from the starting olefins are furthermore generally primarily the straight chain or normal isomers." Example

3 is the only example which describes the linearity of the products of the hydroformylation reaction of 1-dodecene. In the first paragraph, 52 percent of the alcohol was linear. In the second paragraph, 68 percent of the alcohols produced were linear.

It is the Applicants contention that the branched alcohols described by Hunter are not highly branched alcohols which have an average number of branches per molecule of 0.7 to 2.3 as required by the claims of the present invention and thus they are not structurally similar in the context of the present invention. The only description of branched materials given by Hunter is in the reference to the two patents discussed above. Each of those patents expresses a preference for producing linear straight chain alcohols. In the examples, the highest amount of branched alcohols produced was 48 percent – approximately 0.48 branches per molecule. Clearly then, Hunter was not describing highly branched alcohols such as claimed in the present invention. One of ordinary skill in the art reading Hunter would be lead to the two patents referenced for how to make the branched materials of at most 48 percent and would not be led to higher branched alcohols with 0.7 to 2.3 branches per molecule. No prima facie case for obviousness has been established.

#### B. The Experimental Data Overcomes Possible Prima Facie Case of Obviousness

The Examiner asserts that the claims are obvious in view of Hunter because it discloses a detergent formulation wherein said formulation comprises alcohol ethoxy sulfates derived from C<sub>11-15</sub> alcohols which are branched at the 2 position and that the branching is methyl, ethyl, butyl, propyl, or amyl. The Examiner admits that Hunter lacks a specific teaching with respect to the branching proportions but states that it would have been obvious to one of ordinary skill in the art to expect similar characteristics and properties from the sulfated alcohols of Hunter because they are the same compounds but different isomers. The Examiner states that a prima facie case of obviousness has been made because the sulfates of the reference are very close structurally and have similar utilities.

For the reasons discussed above, the Applicants believe that a prima facie case of obviousness has not been established. Even if it had been established the data provided in the application and the two declarations provides the requisite showing to overcome a prima facie case of obviousness in this situation.

In Table I (p. 32) of the present application, comparative data is provided. One of the comparative materials is NEODOL® 45 alcohol which is an alcohol made by a process very much

as described in the two Van Winkel et al. patents referenced in Hunter. The NEODOL® 45 alcohol had 0.3 branches per molecule and a linearity of 78 percent. The detergency results shown in Table III (p. 34) clearly show the advantage of the highly branched alcohol sulfates of the present invention (6-2, 6-3 and 6-1) over the sulfates of NEODOL® 45 mostly linear alcohol. It is a reasonable conclusion to make from this data that the highly branched alcohol sulfates of the present invention would be superior to any of the materials which may be suggested by Hunter which would be mostly linear in structure. It is impossible to compare Hunter directly because the reference does not provide the requisite information about its compositions.

The October 9, 2006 Rule 132 Declaration of Warren W. Schmidt (hereinafter referred to as the "first Declaration") (Evidence Appendix B), submitted in this application and enclosed herewith, describes experiments which show that a branched alcohol sulfate within the scope of the present invention has much better detergency than an alcohol sulfate which was 60 percent branched (LIAL 145 alcohol sulfate). Since this sulfate is generally like those in the description of Hunter and has even more branching than possible in Hunter, it is reasonable to conclude that a comparison with it would provide meaningful data to predict how the materials of Hunter would perform.

The Applicants have enclosed a copy of Technical Bulletin 22/91 of EniChem Augusta Industrial which is entitled "LIAL Detergent Alcohols" (Evidence Appendix C). The LIAL alcohols are described in general on page 8 of the Technical Bulletin wherein the structures of the various isomers are given. It is clearly shown that the linear isomer is approximately 50 percent of the alcohol and the branched isomers amount to approximately 50 percent of the total. Therefore, the extent of branching in the LIAL products is approximately 50 percent in general. None of these isomers are alkoxyated.

The properties of LIAL 145 are given on page 10 and in the following pages typical gas chromatograms for this and other products are shown including the area percent for each of the isomers. It can be seen that the total of the area percent adds up to approximately 100 percent. For LIAL 145, the total amount of linear material, 1-dodecanol (0.245 percent), 1-tridecanol (0.371 percent), 1-tetradecanol (23.207 percent), and 1-pentadecanol (15.657 percent) is approximately 39.5 percent. Thus, the amount of branched material in this product is approximately 60 percent as stated in the reference. This product does not fall within the scope of the present claims for this reason.

In the first Declaration (Evidence Appendix B), the radiotracer multisebum detergency of alcohol sulfates of NEODOL® 45 alcohol, LIAL 145 product, and a separated branched fraction of NEODOL® 45 alcohol (the branched portion which is about 20 percent of the alcohol as manufactured and thus is a C<sub>14-15</sub> branched alcohol with a high amount of branching – approximately 0.95 branches per molecule) were determined. The detergency was observed on polyester cotton fabric (65/35) in water with a 150 ppm water hardness and the sulfate formulation for each was 0.2 grams per liter of surfactant, 0.34 grams per liter of Zeolite 4A and 0.24 grams per liter of sodium carbonate. NEODOL® 45 alcohol is approximately 80 percent linear and 20 percent branched and the LIAL 145 product is approximately 60 percent branched. The primarily branched fraction of NEODOL® 45 alcohol was about 95 percent branched and 5 percent linear and contained no quaternary carbon atoms and was nearly exclusively branched at the 2-alkyl position in the alcohol and had an average number of branches per molecule of approximately 0.95 and contained a distribution of branches of 31.5 percent methyl, 12.2 percent ethyl, 11.3 percent propyl, 12.2 percent butyl, 11.3 percent pentyl and 15.5 percent hexyl and there were approximately 1 percent of random branches which apparently were methyl and ethyl branches.

The results of the multisebum detergency tests are shown in the following table; and

Alcohol Sulfate	Percent Detergency at 10°C
N45 Alcohol Sulfate	15.8
LIAL 145 Alcohol Sulfate	18.5
Branched Fraction of N45 Alcohol Sulfate	34.5

These detergency experiments show a dramatic improvement in cold water cleaning by the substitution of the branched fraction of NEODOL® 45 alcohol for the approximately 60 percent branched LIAL 145 product and the approximately 20 percent branched NEODOL® 45 alcohol sulfate. The detergency only increases from 15.8 to 18.5 when going from the 20 percent branched material (NEODOL® 45 alcohol) to the 60 percent branched material (LIAL 145) whereas the detergency increases much more, from 18.5 to 34.5 when going from 60 percent branched to the 95 percent branched material (branched fraction of NEODOL® 45 alcohol). This result could not be predicted from results achieved from lesser branched materials, including the LIAL 145 material. These results show an unexpected nonobvious increase in the cold water detergency from the results achieved by the prior art product which is more highly branched than the materials of Hunter.

The Applicants submitted with the response of July 16, 2007 in this case a second Declaration Under Rule 132 from William Warren Schmidt (hereinafter referred to as the “second Declaration”) (Evidence Appendix A) to prove that the invention as claimed in the claims was nonobvious. This declaration describes experiments which were carried out with a Neodol 45 sulfate and sulfates of a C<sub>14</sub> branched alcohol and two different C<sub>14-15</sub> branched alcohols. All of the branched alcohols were prepared by skeletal isomerization of the described internal olefins according to the procedure described in Example 5 of the present application. Two of the sulfates had a branching index of 0.92 and 0.94 and the third had a branching index of 1.03. All have methyl branching, ethyl branching, and branching at the C<sub>2</sub> position with the scope of the claims.

The multisebum detergency was determined for the Neodol 45 sulfate and the branched alcohol sulfates according to the procedure described in the present application. The experiments described in the first Declaration (Evidence Appendix B) and in this application were carried out more than 10 years ago. A slightly different multisebum soil had been obtained since that time. In general, it has been determined that this new multisebum soil results in a slightly lower detergency level than the old multisebum soil used in the experiments described in the first Declaration and in this application.

It can be seen that the multisebum detergency for the Neodol 45 sulfate was determined to be 10.6. The detergencies for the branched C<sub>14</sub> and the two branched C<sub>14-15</sub> alcohol sulfates were determined to be 25.1, 27.9 and 26.3. These results cannot directly be compared with the results from the first Declaration and the examples in the present application because of the difference in the multisebum soil and because the level of surfactant used in the second Declaration experiments was higher—0.4 grams per liter. The least significant difference at 95 confidence level is about 2 for these experiments. As discussed below, the Applicants believe that this data shows that there is a significant difference in the detergencies of the branched alcohol sulfates within the scope of the claims of the present invention and the Hunter composition which, the Applicant’s assert, is higher linear like the Neodol 45 sulfate.

The data shown in this first Declaration clearly proves that a branched alcohol sulfate provided a considerably higher multisebum detergency than the Neodol 45 alcohol sulfate it was compared against (35.5 versus 15.8) and that the detergency of the 60% branched Lial 145 alcohol sulfate was only slightly better than that of the Neodol 45 alcohol sulfate (18.5 versus 15.8). The data in the experiments provided in the second Declaration also shows that sulfates of branched

alcohols within the scope of the claims of the present invention give much better multisebum detergencies than the mostly linear Neodol 45 alcohol sulfate. Based on this the Declarant stated that it is reasonable to conclude that the branched alcohol sulfates of the present invention give a much better detergency than Lial 145 alcohol sulfate. Since the Lial 145 alcohol sulfate is higher in branching than the compositions of Hunter (because Hunter's composition may contain no more than 48% branching but more likely have considerably less branching) it is reasonable to conclude that sulfates of branched alcohols within the scope of the amended claims would likewise give superior detergencies than the products described in Hunter.

The Examiner has held that the data provided in the application and the two Declarations is insufficient to overcome the rejection because it is not commensurate in scope with the claimed invention. The Applicants assert that the Declarations taken together with the data in the application is quite extensive especially in light of the difficulty and expense in making these different materials. Between the data in the examples and that in the two declarations, alcohols with carbon numbers throughout the claimed range (14 to 20) have been provided and evaluated. Alcohols with different branching indexes have been evaluated as well.

The Applicants submit that the data in the application and in the Declarations prove the superiority in terms of detergency of the alcohol alkoxy sulfate compositions of the present invention over alkoxy sulfate compositions which could be made with the alcohols of Hunter which are less than 50 percent linear and that this proof is sufficient to overcome a prima facie case of obviousness. For this reason, the Applicants assert that the obviousness rejection in view of Hunter should be overturned.

#### *Section 103(a) Rejection Based on Grifo*

Grifo is said to disclose a detergent composition of poly-oxy-alkylene ether sulfates having at least 10 carbon atoms and a plurality of branched chains. The Applicants agree that Grifo lacks a specific teaching with sufficient specificity with respect to the branching proportions and the position of the branching. The basis of the rejection is that these chemical compounds have very close structural similarities to the claimed compositions and would be expected to possess similar properties.

#### A. No Prima Facie Case for Obviousness has Been Established



### 1. The Structural Dissimilarities make the Properties Different

The Applicants disagree that the reference describes chemical compounds with very close structural similarities to the claimed compositions. As provided in the present claims, the compositions of the present invention have an average chain length per molecule of from 14 to 20 carbon atoms. This chain length is important to achieve the detergency advantages of the present invention. This is supported by the comparative results shown in Table III (p. 34 of the specification) wherein the detergency of the C<sub>14-15</sub>, C<sub>15</sub> and C<sub>17</sub> alcohol sulfates were all much better than that of the C<sub>13</sub> alcohol sulfate. Thus, the Applicants have shown that changing the chain lengths can create different properties.

The Applicants submit that Grifo describes alcohols with shorter chain lengths than provided for in the present claims. At the bottom of column 1 of Grifo, a list of exemplary alcohols is given. These alcohols in order are an octanol (chain length 8), a nonanol (chain length 9), another octanol, another nonanol, still another nonanol, another octanol, another nonanol, octanol again, another nonanol, a heptanol (chain length 7), another heptanol, six more octanols and finally a decanol (chain length 10). At the top of column 2 and in Table 1, Grifo makes reference to oxotridecyl alcohol which is prepared from tetrapropylene by the oxo process. One of the possible isomers of tridecyl alcohol is a linear alcohol having chain length of 13 carbon atoms. It is known that this alcohol is present in only small amounts. The other isomers will be branched and have shorter chain lengths.

No prima facie case of obviousness has been established.

### 2. There is no Structural Similarity

The Declaration Under Rule 132 of Warren W. Schmidt submitted in this application (hereinafter referred to as “the third Declaration”) (Evidence Appendix H) describes the reaction mechanisms that occur in the preparation of tetrapropylene by the process which was commonly used at the time of the Grifo patent. The third Declaration shows that the reaction will produce many different structures of branched compounds having 12 carbon atoms. The third Declaration shows that a substantial proportion of these structures will contain quaternary carbon atoms. Thus, a tridecyl alcohol mixture composition produced from tetrapropylene will contain a substantial amount of quaternary carbon atoms. As stated in the present application, this adversely effects the

biodegradability of detergent compounds. The present claims require that the composition have less than 0.5 atom percent of quaternary carbon atoms. In the third Declaration, Warren W. Schmidt declares that the hydroformylation of the product of the tetramerization of propylene would have produced a mixed alcohol containing a much larger amount of quaternary carbon atoms than provided for in the present claims and that this mixed alcohol would have exhibited inferior biodegradability.

No prima facie case of obviousness has been established.

#### B. The Experimental Data Overcomes Possible Prima Facie Case of Obviousness

The Applicants assert that the data provided in the application proves that the longer chain length alcohol alkoxy sulfates of the present invention will have enhanced detergency with respect to the detergents described in Grifo. This data is discussed in great detail above in the discussion of the Hunter rejection. The data provided in the present application at page 34 in Table III shows the enhanced detergencies of the C 14, 15 and 17 branched alcohol sulfates as compared to the detergency of the C 13 branched alcohol sulfate. Furthermore, the Applicants assert that the detergents described in Grifo will contain a much higher amount of quaternary atoms than provided for in the present claims and thus will be much less biodegradable than the compositions which fall within the scope of the present claims. Thus, the Applicants assert that the rejection based on Grifo should be overturned.

#### *Section 103(a) Rejection Based on Oswald*

Oswald is said to disclose the formation of alkoxyated alcohols having C8-C35 (col. 10, lines 49-69) and further teaches that alcohols have a majority 2-methyl and 3-methyl branched with the rest being 2-ethyl (col. 11, lines 23-60). The Applicants agree that Oswald lacks a specific teaching with sufficient specificity with respect to the branching proportions and the position of the branching. The basis of the rejection is that these chemical compounds have very close structural similarities to the claimed compositions and would be expected to possess similar properties.

Further, this rejection is improper because the Examiner already found the claims allowable in light of the Oswald reference which was cited and considered by the Examiner on October 15, 2005.

#### A. The Obviousness Rejection Based on Oswald

The Examiner states that Oswald discloses the formation of alkoxyated alcohols having 8 to 35 carbon atoms and further teaches that alcohols have a majority of 2-methyl and 3-methyl branching with the rest being 2-ethyl. The passage cited by the Examiner in column 10 of the reference describes the hydroformylation of an olefinic cracked petroleum distillate feed, particularly in the C<sub>8</sub> to C<sub>35</sub> carbon range, preferably produced from petroleum residua by high temperature thermal cracking, and containing 1-n olefins as the major type of olefin components. Nothing is said in that passage about the formylation of alkoxyated alcohols.

The passage in column 11 cited by the Examiner describes the compositions produced by the hydroformylation as aldehydes and/or alcohols of a semi-linear character and as containing n-aldehydes, 2-methyl and 3-methyl branched aldehydes (or alcohols) as the major products. At the bottom of column 11, the compositions are described as containing more than 30 percent normal alkanal and/or more than 20 percent normal alkanol. At two different places in the passages cited by the Examiner, the compositions are described as having an average of less than 1 branch per molecule.

The Applicants compositions are highly branched alkoxyated alcohols. The reference does not describe an alkoxyated alcohol of any kind. Further, the reference describes compositions which contain a large amount of linear alcohol. Finally, the claims as amended describe alkoxyated alcohol compositions having an average number of branches per molecule of 1.3 to 2.1 whereas the compositions of the reference are described as having less than 1 branch per molecule. The compositions of Oswald simply would not produce the detergency results which are produced by the compositions of the present invention. The Applicants assert that the data in the application and the declarations proves that alcohols having such high amounts of linear material are inferior.

Conclusion

Based upon the above argument, the Applicants request that the Examiner's rejections be overturned upon this appeal.

Respectfully submitted,

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## CLAIMS APPENDIX

1. A biodegradable sulfate composition comprising sulfates of an alkyl branched primary alcohol composition having an average chain length per molecule of from 14 to 19 carbon atoms, wherein said alcohol composition has an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, and said branching comprises methyl and ethyl branches and at least 40% of the branches are methyl branches and 5% to 30% of the number of branches are ethyl branches and from 5 to 25% of the number of branches are on the C<sub>2</sub> atoms of the composition.
2. The biodegradable sulfate composition of claim 1, wherein the average number of branches per chain ranges from 1.5 to 2.3.
3. The biodegradable sulfate composition of claim 1, wherein said alcohol composition contains less than 5% linear alcohols.
4. The biodegradable sulfate composition of claim 3, wherein said alcohol composition contains less than 3% linear alcohols.
6. The biodegradable sulfate composition of claim 1, wherein from 10-20% of the number of branches are on the C<sub>2</sub> atoms of the alcohol composition.
7. The biodegradable sulfate composition of claim 1, wherein from 10-50% of the number of branches are on the C<sub>3</sub> atoms of the alcohol composition.
8. The biodegradable sulfate composition of claim 2, wherein from 15-30% of the number of branches are on the C<sub>3</sub> atoms of the alcohol composition.
12. The biodegradable sulfate composition of claim 1 wherein from 10% to 20% of the number of branches are ethyl branches.
70. A branched primary alcohol composition having an average chain length per molecule of from 14 to 19 carbon atoms, an average number of branches per molecule chain ranging from 0.7 to 2.1, said branching comprising methyl and ethyl branches, and less than 0.5 atom % of quaternary carbon atoms, and wherein less than 5% of the alcohol molecules in the composition are linear alcohols and at least 40% of the branches are methyl branches and wherein 5% to 30% of the number of branches are ethyl branches and wherein 5 to 25% of the number of branches are on the C<sub>2</sub> atoms of the alcohol composition.
72. The composition of claim 70, comprising a sulfate of the alcohol composition.

73. The composition of claim 70, comprising an ethoxysulfate of the alcohol composition.
75. The composition of claim 70 having an average number of branches per molecule ranging from 1.3 to 2.1.
77. A biodegradable branched primary alcohol composition having an average chain length per molecule of from 14 to 19 carbon atoms, an average number of branches per molecule of 0.7 to 2.3, said branching comprising methyl and ethyl branches, and wherein from 5-25% of the branching is at the C<sub>2</sub> position relative to the hydroxyl carbon atom, and from 10% to 50% of the branches are located at the C<sub>3</sub> position and at least 40% of the branches are methyl branches and from 5% to 30% of the number of branches are ethyl branches, said composition having less than 0.5 atom % of quaternary carbon atoms.
79. The composition of claim 77, having an average number of branches ranging from 0.7 to 2.1.
81. The composition of claim 77, wherein less than 5% of the alcohol molecules are linear.
82. The composition of claim 77, comprising a sulfate of the composition.
83. The composition of claim 77, comprising an ethoxysulfate of the composition.
84. The biodegradable sulfate composition of claim 1 wherein said alcohol composition contains branching at the C<sub>2</sub> and C<sub>3</sub> carbon positions.
85. A biodegradable sulfate composition comprising sulfates of an alkyl branched primary alcohol composition having an average chain length per molecule of from 14 to 17 carbon atoms, wherein said alcohol composition has an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, and said branching comprises methyl and ethyl branches and 5% to 25% of the number of branches are on the C<sub>2</sub> atoms of the alcohol composition and at least 40% of the branches are methyl branches and from 5% to 30% of the number of branches are ethyl branches.
86. The biodegradable sulfate composition of claim 85 wherein said alcohol composition contains less than 5% of linear alcohols.
87. The biodegradable sulfate composition of claim 86 wherein said alcohol composition contains less than 3% linear alcohols.
88. The biodegradable sulfate composition of claim 85 wherein from 10 to 50% of the number of branches are on the C<sub>3</sub> atoms of the alcohol composition.

89. The biodegradable sulfate composition of claim 88 wherein from 15 to 30% of the number of branches are on the C<sub>3</sub> atoms of the alcohol composition.
92. The biodegradable sulfate composition of claim 85 wherein said alcohol composition contains at least 5% of isopropyl terminal type of branching.
93. The biodegradable sulfate composition of claim 85 wherein said alcohol composition is obtained by skeletally isomerizing olefins under skeletal isomerization conditions.
94. A branched primary alcohol composition having an average chain length per molecule of from 14 to 17 carbon atoms, an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, and said branching comprises methyl and ethyl branches and 5% to 25% of the number of branches are on the C<sub>2</sub> atoms of the alcohol composition and at least 40% of the branches are methyl branches and 5% to 30% of the number of branches are ethyl branches.
95. The alcohol composition of claim 94 wherein said alcohol composition contains less than 5% of linear alcohols.
96. The alcohol composition of claim 95 wherein said alcohol composition contains less than 3% linear alcohols.
97. The alcohol composition of claim 94 wherein from 10 to 50% of the number of branches are on the C<sub>3</sub> atoms of the alcohol composition.
98. The alcohol composition of claim 97 wherein from 15 to 30% of the number of branches are on the C<sub>3</sub> atoms of the alcohol composition.
101. The alcohol composition of claim 94 wherein said alcohol composition contains at least 5% of isopropyl terminal type of branching.
102. The alcohol composition of claim 94 wherein said alcohol composition is obtained by skeletally isomerizing olefins under skeletal isomerization conditions.
103. The biodegradable sulfate composition of claim 1 wherein the average number of branches per chain ranges from 0.7 to 2.1.
104. The biodegradable sulfate composition of claim 1 wherein the average chain length per molecule is from 14 to 17 carbon atoms.
105. The branched primary alcohol composition of claim 70 wherein the average chain length per molecule is from 14 to 17 carbon atoms.

106. The biodegradable branched primary alcohol composition of claim 77 wherein the average chain length per molecule is from 14 to 17 carbon atoms.
107. The biodegradable branched primary alcohol composition of claim 77 wherein the average number of branches is from 0.7 to 2.1.
108. The biodegradable sulfate composition of claim 85 wherein the average number of branches per molecule is from 0.7 to 2.1.
109. The branched primary alcohol composition of claim 94 wherein the average number of branches per molecule is 0.7 to 2.1.



## **EVIDENCE APPENDIX**

### **APPENDIX A**

Second Rule 132 Declaration

### **APPENDIX B**

First Rule 132 Declaration

### **APPENDIX C**

Technical Bulletin 22/91 of EniChem Augusta Industrial entitled "LIAL Detergent Alcohols"

### **APPENDIX D**

Announcement of the Southwest Regional Industrial Innovation Awards Program Symposium of the American Chemical Society Honoring the Present Inventors

### **APPENDIX E**

American Chemical Society Awards Ceremony Presentation

### **APPENDIX F**

"Solution and Performance Properties of New Biodegradable High-Solubility Surfactants," Fifth World Surfactants Conference, 2000

### **APPENDIX G**

Slide on Detergency Performance of Alcohol Sulfates

### **APPENDIX H**

Third Rule 132 Declaration

## **RELATED PROCEEDINGS APPENDIX**

Copending related application Serial No. 11/748,976 has been found to have allowable claims and is the subject of an Ex parte Quayle action. Copending related application Serial No. 12/119,422, filed May 12, 2008, has been rejected.